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Production and marketing constraints faced by tomato growers in riverine areas of Chhattisgarh Plain

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Abstract

Vegetable cultivation is a major source of income and livelihood for farmers in the riverine areas of the Chhattisgarh Plain, yet production and marketing constraints continue to limit crop productivity and farm income. This study was undertaken to identify and prioritize the major production and marketing constraints faced by tomato growers in the region. Primary data were collected from 230 tomato growers comprising 111 marginal, 58 small, 37 medium, and 24 large farmers using a structured interview schedule. The Garrett Ranking Technique was applied to prioritize the constraints according to their severity. Pest and disease infestation emerged as the most severe production constraint, while price fluctuation was identified as the most serious marketing constraint. Based on these findings, the study recommends strengthening agricultural extension services, ensuring the timely availability of quality inputs, promoting farm mechanization, developing storage and cold-chain infrastructure, and encouraging collective marketing through Farmer Producer Organizations (FPOs). The implementation of these measures is expected to enhance the productivity, profitability, and market efficiency of vegetable cultivation in the riverine areas of the Chhattisgarh Plain.

Keywords: Tomato cultivation, Garrett ranking technique, production constraints, marketing constraints, riverine areas, Chhattisgarh plain

1. Introduction

Riverine areas are the lands situated along the banks and floodplains of rivers, characterized by fertile alluvial soils, adequate moisture availability, and favourable climatic conditions for crop cultivation. In Chhattisgarh Plain Zone, major rivers such as the Mahanadi Shivanthi Kharun Pairi and their tributaries create extensive riverine tracts that support agricultural activities. Vegetable cultivation occupies a central place in Indian agriculture, contributing substantially to farmers' income, rural employment and household nutritional security. Crops such as tomato are widely grown across the country because of their high economic value, short duration and strong market demand. Despite this potential, the production and marketing of vegetables remain constrained by a range of technical, financial and infrastructural factors that adversely affect both productivity and profitability.

The Chhattisgarh Plain is one of the principal vegetable-growing regions of the state, with tomato extensively cultivated in its riverine tracts. Chhattisgarh Scenario According to the third advance estimates for 2024-25, the area devoted to horticultural crops in Chhattisgarh is

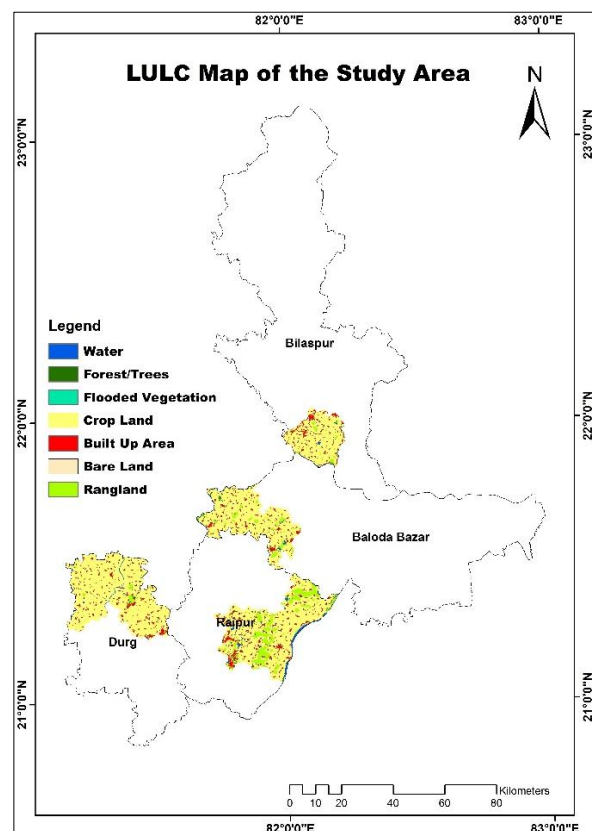
projected to span 844.31 thousand hectares, with an anticipated total production of 10610.066 thousand metric tonnes. In Chhattisgarh total area under Vegetable crops 515.902 thousand ha. and Production under Vegetable crop 207.20 thousand metric ton (third Advanced estimates of horticultural crops 2024-25). (Source-Directorate of horticulture and farm forestry 2024-25) The present study was undertaken to examine the major production and marketing constraints faced by vegetable growers in the riverine areas of the Chhattisgarh Plain, using the Garrett Ranking Technique, based on primary data collected from 230 Tomato vegetable growers.

2. Methodology

2.1 Study Area

The study was conducted in the riverine areas of the Chhattisgarh Plain. Four districts — Bilaspur, Durg, Raipur and Baloda Bazar-Bhatapara were purposively selected. From each district, one block situated in the riverine tract was chosen Bilha (Bilaspur), Dhamdha (Durg), Arang (Raipur) and Simga (Baloda Bazar-Bhatapara). Three villages were further selected from each block — Daguri, Murkuta and

Nawagaon from Bilha Mohlai, Gadaghat and Sirsa Khurud from Dhamdha; Nishada, Paragaon-I and Chhatera from Arang and Kachloan, Tendubhata and Kirwai from Simga — giving a total of 12 sample villages. These villages lie along the Mahanadi and Shivrath rivers where fertile alluvial soils, favourable agro-climatic conditions and assured irrigation support the cultivation of tomato making the area well suited for examining the production and marketing constraints faced by Tomato growers.



Source: computed by Google Earth Engine

Fig 1: Location Map of the Study Area

Table 1: River Flow Length within Block (km)

Block	Major River	River Flow Length within Block (km)
Bilha	Shivrath River	21
Dhamdha	Shivrath River	43
Simga	Shivrath River	48
Arang	Mahanadi River	48
Total (4 Blocks)		160

Source: computed by Google Earth Engine

2.2 Sample Size Determination

The sample size for the study was determined using Cochran's (1977) ^[1] sample size formula with Finite Population Correction (FPC), expressed as:

$$n_0 = Z^2 pq / e^2$$

where n_0 is the initial sample size; Z is the standard normal variate at the 95 per cent confidence level (1.96); p is the estimated proportion of the population (0.50); $q = 1 - p$; and e is the desired level of precision (0.05).

Since the population of vegetable growers in the study area was finite ($N = 558$), the initial sample size was adjusted using the Finite Population Correction formula:

$$n = n_0 / [1 + (n_0 - 1)/N]$$

where n is the final sample size after finite population correction, and N is the total population of vegetable growers (558). final sample size for the present study was estimated at 230 Tomato growers after applying the Finite Population Correction (FPC).

2.3 Data Collection

The study drew on both primary and secondary data. Primary data were collected from the selected respondents through personal interviews using a pre-tested, structured interview schedule covering socio-economic characteristics, vegetable cultivation practices, and production and marketing constraints. Secondary data were obtained from published reports, government publications and records of the Department of Horticulture and other relevant agencies.

2.4 Analytical Framework: Garrett Ranking Technique

The constraints affecting the production and marketing of Tomato were analysed using the Garrett Ranking Technique. Under this method, respondents were asked to assign ranks to the constraints they faced, and the ranks given by each respondent were converted into percent position scores using the formula:

$$\text{Percent position} = 100 \times (R_{ij} - 0.5) / N_j$$

where R_{ij} is the rank given to the i -th constraint by the j -th respondent, and N_j is the total number of constraints ranked by the j -th respondent. The percent positions so obtained were converted into scores using Garrett's Ranking Table, and the mean score for each constraint was computed by averaging the scores across all respondents. Constraints were then ranked in descending order of their Garrett mean scores, with the highest score indicating the most severe constraint.

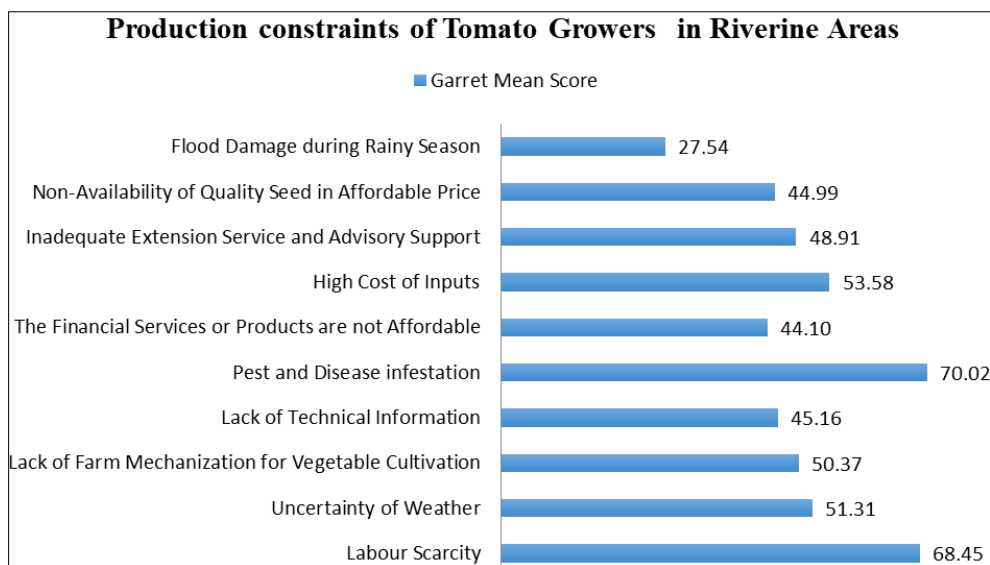
3. Results and Discussion

3.1 Production Constraints Faced by Tomato Growers

The production constraints faced by Tomato growers, analysed using the Garrett Ranking Technique, are presented in Table 2. Pest and disease infestation emerged as the most severe production constraint, securing the highest Garrett mean score (70.02) and ranking first, followed by labour scarcity (68.45) and the high cost of production inputs (53.58). These three constraints directly raise the cost of cultivation and depress yields, and together they account for the bulk of the productivity gap reported by growers in the study area. Uncertainty of weather (51.31) and lack of farm mechanization (50.37) were also reported as important constraints, followed by inadequate extension services (48.91), lack of technical information (45.16), non-availability of quality seed at an affordable price (44.99) and limited access to affordable financial services (44.10). Flood damage during the rainy season ranked last (27.54), reflecting its relatively localized and seasonal occurrence compared with the more pervasive constraints above it.

Table 2: Garrett Mean Score of Production Constraints in Tomato Growers in Riverine Areas (n = 230)

S. No.	Production Constraints	Garrett Mean Score	Rank
1	Pest and Disease Infestation	70.02	I
2	Labour Scarcity	68.45	II
3	High Cost of Inputs	53.58	III
4	Uncertainty of Weather	51.31	IV
5	Lack of Farm Mechanization for Vegetable Cultivation	50.37	V
6	Inadequate Extension Service and Advisory Support	48.91	VI
7	Lack of Technical Information	45.16	VII
8	Non-Availability of Quality Seed in Affordable Price	44.99	VIII
9	The Financial Services or Products are not Affordable	44.10	IX
10	Flood Damage during Rainy Season	27.54	X

**Fig 2:** Garrett Mean Scores of Production Constraints

Taken together, these findings indicate that improving plant protection measures, strengthening extension support, promoting mechanization and ensuring the timely availability of quality inputs would substantially enhance vegetable productivity in the study area.

3.2 Marketing Constraints Faced by Tomato Growers

The marketing constraints faced by Tomato growers are presented in Table 3. Price fluctuation was identified as the most serious marketing constraint, with the highest Garrett mean score (60.29), followed by high transportation cost

(52.26) and lack of storage and cold-chain facilities (48.98). These constraints raise marketing costs and compel farmers to sell their produce immediately after harvest, often at unfavourable prices. Dependence on intermediaries ranked fourth (46.59), reducing farmers' bargaining power and their share in the final consumer price. Other notable constraints included high post-harvest losses (42.68), lack of grading and standardization (39.84), lack of market information (35.16), the absence of Farmer Producer Organizations (32.97) and inadequate market infrastructure (28.65). Poor road connectivity ranked last (20.97).

Table 3: Garrett Mean Score of Marketing Constraints in Tomato Growers in Riverine Areas (n = 230)

S. No.	Marketing Constraints	Garrett Mean Score	Rank
1	Price Fluctuation	60.29	I
2	High Transportation Cost	52.26	II
3	Lack of Storage / Cold Chain Facility	48.98	III
4	Dependence on Intermediaries	46.59	IV
5	High Post-Harvest Losses	42.68	V
6	Lack of Grading and Standardization	39.84	VI
7	Lack of Market News and Information	35.16	VII
8	Lack of FPOs / Collective Marketing Mechanism	32.97	VIII
9	Inadequate Market Infrastructure (Shed, Weighing, Auction Platform)	28.65	IX
10	Poor Road Connectivity to Market	20.97	X

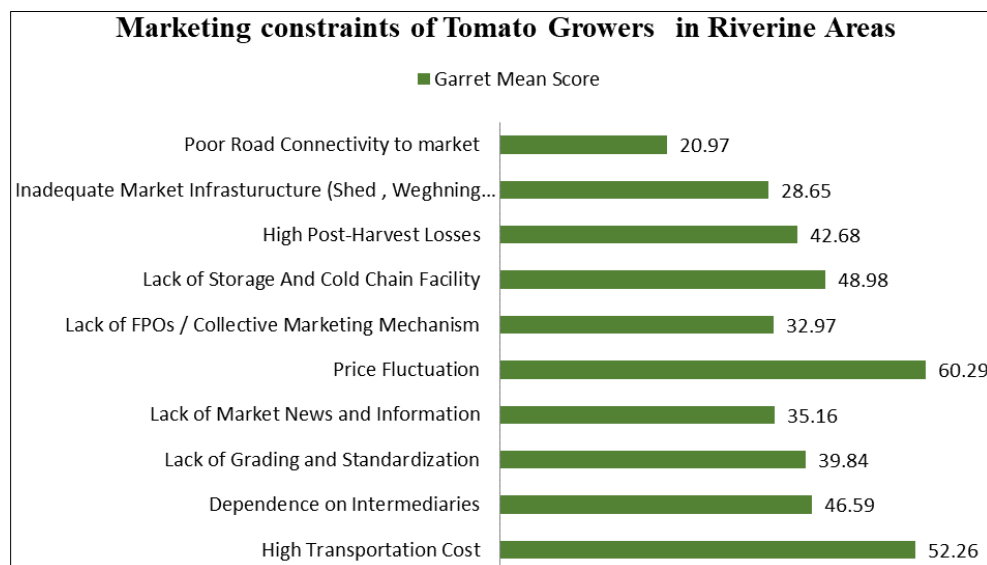


Fig 3: Garrett Mean Scores of Marketing Constraints

Overall, these results suggest that strengthening market infrastructure, expanding storage facilities, improving transportation and encouraging collective marketing would meaningfully improve marketing efficiency and raise farmers' net income from vegetable cultivation.

4. Suggestions to Overcome Production Constraints

- 1. Pest and Disease Infestation:** Regular training on Integrated Pest and Disease Management (IPM), timely advisory services, and easy availability of quality plant protection chemicals should be ensured to minimize crop losses.
- 2. Labour Scarcity:** Labour-saving farm machinery and Custom Hiring Centres should be promoted to reduce dependence on manual labour during peak farming operations.
- 3. High Cost of Inputs:** Quality seeds, fertilizers and pesticides should be made available at affordable prices through government support and Farmer Producer Organizations (FPOs).
- 4. Uncertainty of Weather:** Farmers should be encouraged to adopt climate-resilient practices, weather-based advisories and crop insurance to reduce weather-related risks.
- 5. Lack of Farm Mechanization:** Subsidies and easy access to suitable farm implements for vegetable cultivation should be provided, particularly for small and marginal farmers.
- 6. Inadequate Extension Services:** Regular field visits, demonstrations and technical guidance by extension personnel should be strengthened to improve farmers' knowledge.
- 7. Lack of Technical Information:** Training programmes on improved vegetable production technologies should be organized regularly by agricultural departments and Krishi Vigyan Kendras (KVKs).
- 8. Non-Availability of Quality Seed:** Certified vegetable seeds should be supplied to farmers in adequate quantity and at reasonable prices before the sowing season.
- 9. Limited Access to Affordable Finance:** Institutional credit facilities should be made more accessible through

simplified loan procedures and timely financial assistance.

- 10. Flood Damage during the Rainy Season:** Flood-resilient cultivation practices, proper drainage and crop insurance should be promoted to minimize production losses in riverine areas.

5. Suggestions to Overcome Marketing Constraints

- 1. Price Fluctuation:** Timely market information, price forecasting and better implementation of market support mechanisms should be promoted to reduce the impact of price fluctuations.
- 2. High Transportation Cost:** Rural transport facilities should be improved, and transportation support may be provided through Farmer Producer Organizations (FPOs) or cooperative marketing arrangements.
- 3. Lack of Storage / Cold Chain Facility:** Cold storage and pack-house facilities should be established near production areas to reduce post-harvest losses and enable farmers to sell at better prices.
- 4. Dependence on Intermediaries:** Direct marketing channels such as farmers' markets, FPOs and digital marketing platforms should be encouraged to increase farmers' share in the consumer price.
- 5. High Post-Harvest Losses:** Farmers should be trained in proper harvesting, grading, packaging and post-harvest handling techniques to minimize losses.

6. Conclusion

This study identified the major production and marketing constraints affecting Tomato growers in the riverine areas of the Chhattisgarh Plain using the Garrett Ranking Technique. Among production constraints, pest and disease infestation, labour scarcity and the high cost of production inputs emerged as the most severe. Among marketing constraints, price fluctuation, high transportation cost and the lack of storage and cold-chain facilities were the leading concerns. These challenges collectively reduce the productivity, profitability and marketing efficiency of vegetable cultivation in the study area. The findings suggest that strengthening agricultural extension services, ensuring the

timely availability of quality inputs, improving storage and transportation infrastructure, and promoting Farmer Producer Organizations can substantially enhance vegetable production, marketing efficiency and farmers' income in the riverine tracts of the Chhattisgarh Plain.

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